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HISTORIC AMERICAN ENGINEERING RECORD

INDEX TO PHOTOGRAPHS

Jet Propulsion Laboratory Edwards Facility, Test Stand C, Building 4217/E-18
Edwards Air Force Base
Boron Vicinity
Kern County
California

HAER No. CA-163-D

Photographers' Credits:

Credit BG: Brian Grogan, Yosemite Photographics, Inc. December 1994/January 1995
Credit WCT: William C. Tibbitts, Photographer, Jet Propulsion Laboratory, Edwards Facility (dates cited in captions)
Credit JPL: JPL staff photographers, Jet Propulsion Laboratory, Edwards Facility (names undetermined, dates cited in captions)
Credit GE: George Emmerson, Photographer, Jet Propulsion Laboratory, Edwards Facility (dates cited in captions)

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CA-163-D-1 Photographic copy of original engineering drawing for Test Stand "C." California Institute of Technology, Jet Propulsion Laboratory, Plant Engineering "New Test Stand Plan -- E[dwards] T[est] S[tation]" drawing no. E18/2-3, 18 January 1957.

CA-163-D-2 Credit JPL. Photographic copy of photograph, looking northeast at unfinished original Test Stand "C" construction. A portion of the corrugated steel tunnel tube connecting Test Stand "C" to the first phase of JPL tunnel system construction is visible in the foreground. The steel frame used to support propellant tanks and engine equipment has been erected. The open trap door leads to a chamber inside the Test Stand "C" base where gaseous nitrogen is distributed via manifolds to Test Stand "C" control valves. (JPL negative no. 384-1568-A, 19 March 1957)

CA-163-D-3 Credit JPL. Photographic copy of photograph, view south into oxidizer tank enclosure and controls on the north side of Test Stand "C" shortly after the

stand's construction in 1957 (oxidizer contents not determined). To the extreme left appear fittings for mounting an engine for tests. Note the robust stainless steel flanges and fittings necessary to contain highly pressurized corrosive chemicals. (JPL negative no. 384-1608-C, 29 August 1957)

CA-163-D-4 Credit WCT. Photographic copy of photograph, aerial view looking south above Test Stand "C" (4217/E-18) and Test Stand "B" (4215/E-16) in 1961. Test Stand "C" lies in the foreground and numerous modifications have been made in its 4-year existence. In-ground cryogenic fuel and oxidizer run tanks have been installed to the south and north of the stand, pressurized by helium stored in a small farm of 13 horizontal tanks in the right midground of the view. Liquid nitrogen is supplied from 4262/E-63 (insulated pipeline at right) to refrigerate propellants. The wooden barrier to the south protects Test Stand "B" and other structures from hazards as well as supporting a wooden hut used for remotely controlled photographic coverage of tests. Two closed-circuit television cameras permit test engineers to monitor events from the Control and Recording Center. The two spherical tanks near the barrier contained distilled water for flushing propellant lines. Note that a test engine is mounted at Test Stand "B"; the ring to the east (left) of the engine injected water into the exhaust gases to cool them. (JPL negative no. 384-2996-B, 12 December 1961)

CA-163-D-5 Credit WCT. Photographic copy of photograph, view looking northwest at nearly completed reinforced concrete "caustic pond" constructed in 1970 to the immediate northeast of Test Stand "C" as part of an exhaust gas scrubber system. The fluorinated oxidizers and borane fuels in use at this time at Test Stand "C" produced highly corrosive or toxic exhaust products which the scrubber system neutralized. In the distance above the pond lies the observation booth of the Control and Recording Center. (JPL negative no. 384-8450-B, 4 September 1970)

CA-163-D-6 Credit WCT. Photographic copy of photograph, looking northeast from original Test Stand "C" base to new atmospheric station scrubber system. The

exhaust compounds from engines tested in open atmosphere (using fluorinated oxidizers and borane fuels) would be directed into the inclined horizontal tube. Here they would be cooled and neutralized by the injection of 1.5% sodium hydroxide solution from the "caustic pond." The vertical "scrubber" tank in the distance removed the last traces of corrosives before exhaust gases were released into the atmosphere by the fan at the scrubber top. (The scrubber was mounted in the semicircular lobe of the "caustic pond" seen in HAER No. CA-163-D-5.) (JPL negative no. 384-8506, 3 November 1970)

CA-163-D-7 Credit WCT. Photographic copy of photograph, view northwest across atmospheric test stand after installation of scrubber system. Duct to scrubber appears at extreme right, extended by a smaller diameter pipe to mount for test item. At top center of view rise propellant calibration tanks (5 gallons capacity in each). Image shows complex web of tubing, wiring, and equipment required for test series. (JPL negative no. 384-9036-A, 23 September 1971)

CA-163-D-8 Credit WCT. Photographic copy of photograph, view southeast across construction of "C" and "D" stand water reclamation pond to unused tower at Test Stand "F." This tower was later moved to Test Stand "C" to support a vacuum test cell. Test Stand "F" was never used due to a test program cancellation after the stand's construction. (JPL negative no. 384-10718-A, 21 November 1974)

CA-163-D-9 Photographic copy of engineering drawing showing the mechanical layout of Test Stand "C" Cv Cell, vacuum line, and scrubber-condenser as erected in 1977-78. JPL drawing by VTN Consolidated, Inc. Engineers, Architects, Planners, 2301 Campus Drive, Irvine, California 92664: "JPL-ETS E-18 (C-Stand Modifications) Control Elevations & Schematics," sheet M-5 (JPL sheet number E18/44-0), 1 September 1977.

CA-163-D-10 Photographic copy of engineering drawing showing the plumbing layout of Test Stand "C" Cv Cell, vacuum line, and scrubber-condenser as erected in 1977-78. JPL drawing by VTN Consolidated, Inc.

Engineers, Architects, Planners, 2301 Campus Drive, Irvine, California 92664: "JPL-ETS E-18 (C-Stand Modifications) Flow Diagram," sheet M-2 (JPL sheet number E18/41-0), September 1, 1977.

CA-163-D-11 Credit WCT. Photographic copy of photograph, image of work being done to tunnel at Test Stand "C." Old corrugated steel tunnel is being cut away, leaving high-pressure nitrogen lines, electrical cables and other services in place while a replacement concrete tunnel and ramp are constructed. View is looking east at Test Stand "C." Note the tank marked "OF_2" (oxygen difluoride) in the upper left of the image on the oxidizer side of Test Stand "C." On the right or south side of Test Stand "C" is a fuel tank marked "B_2H_6" (diborane). (JPL negative no. 344-4187-B, 18 February 1982)

CA-163-D-12 Credit WCT. Photographic copy of photograph, view looking northwest at Test Stand "C" complex from southeast of Stand "B" with shock tube. Note "D" stand in distance and the various tanks stored behind earth revetments. Purpose of radio tower at right undetermined. (JPL negative no. 344-3171-B, 9 July 1979)

CA-163-D-13 Photographic copy of site plan displaying Test Stand "C" (4217/E-18), Test Stand "D" (4223/E-24), and Control and Recording Center (4221/E-22) with ancillary structures, and connecting roads and services. California Institute of Technology, Jet Propulsion Laboratory, Facilities Engineering and Construction Office "Repairs to Test Stand "C," E[dwards] T[est] S[tation], Legend & Site Plan M-1," drawing no. ESP/115, August 14, 1987.

CA-163-D-14 Credit BG. Looking east at Test Stand "C" complex. High-pressure helium tanks are arrayed on the ground in left foreground, with concrete-parged earth barrier 4218/E-19 at right to protect personnel and structures to the south from explosion hazards. Small white structure at left is Building 4224/E-25, a portable magazine. Between 4224/E-25 and the helium tanks lies a row of stakes carrying liquid nitrogen piping from tanks at 4262/E-63 and electrical wiring to Test Stand "C." The vertical vacuum cell (Cv Cell) is

visible in the framework of Test Stand "C" tower (4217/E-18); the tank to the immediate right of the tower at ground level is a nitrogen gas purge tank. The scrubber-condenser tower for the atmospheric test station at Test Stand "C" rises in left background over E-25.

CA-163-D-15 Credit BG. View west from Liquid Nitrogen Tanks (4262/E-63) towards Test Stand "C" complex. Test Stand "C" tower rises above the workshop (4213/E-14). Silhouetted against the workshop is a spherical water tank once used for distilled water and located at Test Stand "C" proper. The Test Stand "C" scrubber-condenser tower rises on the far left of the view.

CA-163-D-16 Credit BG. View looking southeast at Test Stand "C" complex from roof of Control and Recording Center 4221/E-22. The Booster Pumping Station 4227/E-28 lies in the immediate left foreground; pipeline and valves at ground level are for water. In the right midground at the edge of Road "F" lies the Test Stand "C" workshop (4213/E-14) with a trailer to the right (west). Behind 4213/E-14 lie the portable magazine 4224/E-25 and barricade 4218/E-19. Just above the barricade are two small structures: to the left is 4274/E-75 (Compatibility Test Building built in 1966) and at the right is 4210/E-11, built in 1953 originally as a fuel dock for Test Stand "A." (Buildings in the distance above 4274/E-75 and 4210/E-11 are aircraft hangars at North Base, and are not part of the JPL Edwards Facility.) The ramp at the base of the Test Stand "C" tower (center of view) is part of the original concrete base for Test Stand "C"; to the north (left) of the stand lie ancillary tanks and control panels for oxidizers, and to the south (right) of the stand is similar equipment for fuels. To the immediate left (northeast) of the Test Stand "C" tower is the 10-foot diameter atmospheric station scrubber. A 30-inch diameter vacuum duct from the Cv Cell in 4217/E-18 passes in front of the scrubber to the scrubber-condenser tower at the left (above 4227/E-28 in the view). The edges of the Caustic Pond (containing sodium hydroxide solution for neutralizing rocket engine exhaust products) are in view at the base of the scrubber-condenser tower. To the east, behind the scrubber-

condenser tower lies a barricade, to the immediate left (north) end of which lie several 55-gallon steel drums used as emergency burn barrels for vented fluorine gas.

CA-163-D-17 Credit BG. View looking east at Test Stand "C" Cv Cell tower 4217/E-18 and scrubber-condenser tower. In immediate left foreground is a horizontal white tank for high-pressure helium used to pressurize propellant tanks and "pump" propellants during tests; a small stainless steel vent pipe from the tank is supported by a rack, to which a white flag is hung from a pole to signify that no tests are in preparation. To the immediate right of this tank (and in front of the scrubber-condenser tower in this image) stands a light tower with red, yellow, and green flashing lights; these lights were used to indicate to personnel whether the stand could be approached or not. Just below the 10-foot diameter Cv Cell scrubber tank in the image lies an in-ground liquid-nitrogen cooled oxidizer tank (labeled "FLUORINE") and its attendant monitoring and control equipment. Several light stands are mounted in the area for nighttime operations. Just behind the light stand to the immediate right of the oxidizer tank rise slender 5-gallon calibration tanks used for propellant supply during tests at the atmospheric station. To the right of the concrete ramp (part of original 1957 Test Stand "C" construction) lie an in-ground liquid-nitrogen cooled fuel tank and its attendant monitoring and control equipment. The Test Stand "C" tower supports the Cv Cell (large tank in tower), a hoist (top of tower) for installing/removing rocket engines from the cell, and a work platform at the top of the cell. Propellant control panels for rocket engine tests are mounted beneath the work platform. All levels are accessed by an open steel stairway on the south side of the tower. Portable Magazine 4224/E-25 appears at the immediate right of the view.

CA-163-D-18 Credit BG. View northwest at Test Stand "C" complex as seen from top of barrier 4218/E-19. At left rises the Test Stand "C" tower for the Cv Cell, with steel access stairway. In the foreground are situated a nitrogen purge tank (having numerous pipe legs) with two vacuum pumps

to the immediate left. Behind the purge tank runs a series of racks on "Unistrut" poles carrying gas lines and electrical conduits to 4264/E-65. To the right of the tower and purge tank rises the atmospheric station scrubber tank, immediately behind which passes the 36-inch diameter vacuum duct connecting the Cv Cell to the scrubber-condenser tower at far right. The Test Stand "D" tower 4223/E-24 rises in the far background between the scrubber and scrubber-condenser tower.

CA-163-D-19 Credit BG. Detail of Test Stand "C" complex, looking northwest. At left is Test Stand "C" tower containing Cv (v=vertical) test cell, which is connected to scrubber-condenser tower at right by a 36-inch diameter horizontal vacuum duct. This system is not interconnected with the atmospheric test stand, for which the scrubber tank rises in the center of the view. The immediate left foreground contains 55-gallon drums of various lubricants used in the vacuum pumps at Test Stand "C." Piping in racks supported by "Unistrut" poles leads to a burner for vented fuel in right foreground (slender vertical stand with can at top) and to equipment at 4224/E-65 to the east (not in view). JPL personnel at work under shelter by Test Stand "C" tower are dismantling and decontaminating propellant lines and equipment prior to scrapping.